Competency Based Curriculum (CBC)

Solar Electrical System Installation and Maintenance

Level-3

Light Engineering Sector

Curriculum Code:CBC-LE-SESIM-L3-EN-V1

National Skills Development Authority
Chief Adviser's Office
Government of the People's Republic of Bangladesh

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The curriculum is designed based on NSDA approved **Solar Electrical System Installation and Maintenance, Level – 3,** Occupation Competency Standards. It covers the information required to implement the **Solar Electrical System Installation and Maintenance, Level - 3** standard. It is an important supporting document for trainers, assessors and curriculum developers.

This document has been developed by NSDA with the support of ISC representatives'/industry representatives from relevant sectors, academia, curriculum specialists, expert trainers and professionals.

All Government-Private-NGO training institutes of the country recognized by NSDA can use this curriculum to implement skill-based training of **Solar Electrical System Installation and Maintenance, Level –3** course.

Introduction

The importance of skill-based training in socio-economic development of the country is immense. Demand oriented training is an important area for increasing productivity, creating employment and alleviating poverty. Skill development training institutes established at public and private level in Bangladesh are providing skill development training commercially. It is important to have uniform training curriculum based on occupation to improve and harmonize the overall quality of training conducted in all these training institutions. NSDA as provided in the National Skill Development Authority Act, 2018 is formulating uniform curriculum for training programs conducted across the country in various occupations/trades.

Competency standards for various occupations (level based) are being formulated by NSDA with the aim of creating skilled manpower as per the demand of domestic and international labor market.

Skilled and trained trainers are essential for providing training and assessment according to competency standards. For this purpose, the curriculum of **Solar Electrical System Installation and Maintenance, Level -3** has been formulated through an expert committee consisting of ISC/Industry representatives from respective sectors, academia, curriculum specialists, expert trainers and professionals. This curriculum includes essential course design, course structure, course delivery methods, equipment and facilities inventory, and physical facilities. Apart from this, the assessment criteria of trainees, assessment procedure, qualification level and certification process have been inserted.

This curriculum is an NSDA-approved document that describes the overall contents of the training implementation of **Solar Electrical System Installation and Maintenance, Level –3** as per industry demand-based competency standards. The trainees of **Solar Electrical System Installation and Maintenance, Level –3** course can develop themselves as skilled and qualified **Solar Electrician** by following properly.

Competency Based Learning Materials (CBLM) and Assessment tools are developed following this document. Assessment and certification of trainees will also follow this curriculum.

List of Abbreviations

CS	Competency Standard
ISC	Industry Skills Council
NSDA	National Skills Development Authority
BNQF	Bangladesh National Qualifications Framework
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SCVC	Standards and Curriculum Validation Committee
STP	Skills Training Provider
SOP	Standard Operating Procedure
UoC	Unit of Competency
ISO	International Organization for Standardization
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures

Table of Content

Course Design

Name of Course: Solar Electrical System Installation and Maintenance

Skill Level : National Skills Certificate(NSC)-3

Nominal Hours : 270 Hours

List of Unit of Competency

Generic Unit of Competency

Sector Specific Unit of Competency

Occupation Specific Unit of Competency

1. Prepare Site Assessment Report for Large Scale (On-Grid) System and Energy Storage System
2. Interpret Design, Drawing and Specifications for Large Scale (On-Grid) System and Energy Storage System
3. Use Hand and Power Tools in Large Scale (On-Grid) System and Energy Storage System
4. Install Large Scale (On-Grid) System and Energy Storage System
5. Maintain and Troubleshoot Large Scale (On-Grid) System and Energy Storage System

Description of Course

It is a skill-based training course designed to develop the knowledge, skills and workplace attitude required for the Solar Electrical System Installation and Maintenance in Light Engineering Sector. The curriculum covers various skills such as, Prepare Site Assessment Report for Large Scale (On-Grid) System and Energy Storage System, Interpret Design, Drawing and Specifications for Large Scale (On-Grid) System and Energy Storage System, Use Hand and Power Tools in Large Scale (On-Grid) System and Energy Storage System, Install Large Scale (On-Grid) System and Energy Storage System and Maintain and Troubleshoot Large Scale (On-Grid) System and Energy Storage System

Learning Outcome of the Course

Successful completion of this course will lead to certification in **Solar Electrical System Installation and Maintenance**, Level-3 under the Bangladesh National Qualification Framework (BNQF). Also, the course has the following functional, economic, and social learning outcomes.

Work Oriented Learning Outcome

1. Can work effectively as a **Senior Technician**
2. Carryout Workplace Interaction

Financial Learning Outcome

1. Job opportunities will be created as **Senior Technician** in country and abroad.
2. Can contribute to socio-economic development by participating in skill development activities

Social Learning Outcome

1. Social status will increase by achieving personal development
2. The share of skilled human resources will increase in line with changing technology
3. The number of skilled trained **Senior Technician** will increase in the society

Course Structure

Generic Unit of Competency - 00Hrs.

Sector Specific Unit of Competency – 00 Hrs.

Occupation Specific Unit of Competency–270 Hours

Sl. No.	Unit of Competency	Module Title	Learning Outcome	Nominal Hours
1.	Prepare Site Assessment Report for Large Scale (On-Grid) System and Energy Storage System	Preparing Site Assessment Report for Large Scale (On-Grid) System and Energy Storage System	1. Conduct site inspection and collect data 2. Identify potential challenges and constraints 3. Prepare and document the site assessment report	40
2.	Interpret Design, Drawing and Specifications for Large Scale (On-Grid) System and Energy Storage System	Interpreting Design, Drawing and Specifications for Large Scale (On-Grid) System and Energy Storage System	1. Identify signs, symbols, and specifications in the layout drawing 2. Interpret layout drawings 3. Apply freehand sketching	40
3.	Use Hand and Power Tools in Large Scale (On-Grid) System and Energy Storage System	Using Hand and Power Tools in Large Scale (On-Grid) System and Energy Storage System	1. Select hand and power tools 2. Practice to use hand and power tools 3. Maintain hand and power tools	50
4.	Install Large Scale (On-Grid) System and Energy Storage System	Installing Large Scale (On-Grid) System and Energy Storage System	1. Prepare site and system components 2. Assemble and connect components 3. Conduct pre-commissioning testing	90
5	Maintain and Troubleshoot Large Scale (On-Grid) System and Energy Storage System	Maintaining and Troubleshooting Large Scale (On-Grid) System and Energy Storage System	1 Perform routine maintenance 2 Identify and troubleshoot faults 3 Replace faulty components and ensure system restoration	50
			Total Hours	**270**

Analysis of Competency

Generic Unit of Competency	Number of Module
Sector SpecificUnit of Competency	
Occupation SpecificUnit of Competency	
1. Prepare Site Assessment Report for Large Scale (On-Grid) System and Energy Storage System	01
2. Interpret Design, Drawing and Specifications for Large Scale (On-Grid) System and Energy Storage System	01
3. Use Hand and Power Tools in Large Scale (On-Grid) System and Energy Storage System	01
4. Install Large Scale (On-Grid) System and Energy Storage System	01
5. Maintain and Troubleshoot Large Scale (On-Grid) System and Energy Storage System	01
Total	**05**

Course Delivery

1. Face to Face
2. Self Paced Learning
3. On the job
4. Off the job
5. Blended

Course Training Method

A variety of methods can be applied to course training depending on the students' learning interests and abilities. Instructors should select appropriate methods to train students. Some of the common methods used during skills training are:

1. Lecture
2. Presentation
3. Discussion
4. Demonstration
5. Guided Practice
6. Individual Pactice
7. Project Work
8. Problem Solving
9. Brainstorming

Module of Instruction

- Generic
- Sector Specific and
- Occupation Specific

Generic Modules

Sector Specific Module

Occupation Specific Module

Unit of Competency	**Prepare Site Assessment Report for Large Scale (On-Grid) System and Energy Storage System**
Unit Code	**OU-LE-SESIM-01-L3-V1**
Module Title	Preparing site assessment report for large scale (on-grid) system and energy storage system
Module Descriptor	This unit of competency requires the knowledge, skills and attitude to prepare site assessment report for large scale (on-grid) system and energy storage system. It specially includes the tasks -conduct site inspection and collect data, identify potential challenges and constraints and prepare and document the site assessment report
Nominal Hours	**40 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Conduct site inspection and collect data 2. Identify potential challenges and constraints 3. Prepare and document the site assessment report

Learning Outcome -1: Conduct site inspection and collect data	
Assessment Criteria	1. Site inspection is conducted following occupational safety and health standards. 2. Relevant site data is collected as required. 3. Customer energy needs and preferences are documented. 4. Site and Environmental conditions are verified and recorded.
Conditions and Resources	• Workplace or Simulated Workplace • Site inspection checklist • Site information • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. Site inspection checklist 2. Site data 2.1 Shading, 2.2 Roof orientation and inclination 2.3 Available space 2.4 Existing details of Substation, generators and evacuation points. 3. Information of site and Environmental conditions
Job/ Task/ Activity	1. Collect relevant site data 2. Verfy and record site and environmental conditions 3. Prepare site data report accoding to checklist;
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Identify potential challenges and constraints	
Assessment Criteria	1. Potential shading issues and site-specific obstructions are identified; 2. Structural integrity of installation surfaces is evaluated. 3. Placement for components are identified; 4. Weather conditions and potential hazards are evaluated.
Conditions and Resources	• Workplace or Simulated Workplace • challenges and constraints • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Structural integrity of installation surfaces 2. Placement for components 3. Weather conditions and potential hazards
Job/ Task/ Activity	1. Identify shading and site-specific obstructions; 2. Evalute structural integrity of installation surfaces 3. Identify placement for components; 4. Evaluate weather conditions and potential hazards;
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Prepare and document the site assessment report	
Assessment Criteria	1. Site data is consolidated; 2. Challenges, risks, and mitigation strategies are documented. 3. Site assessment report including recommendations is prepared.
Conditions and Resources	• Workplace or Simulated Workplace • Assessment report checklist • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Procedure of consolidate data 2. Challenges and risks 3. Challenges and risks mitigating strategies 4. Assessment report checklist
Job/ Task/ Activity	1. Consolidate site data 2. Identify challenges and risks 3. Identify mitigating strategies 4. Prepare site assessment report
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Interpret Design, Drawing and Specifications for Large Scale (On-Grid) System and Energy Storage System**
Unit Code	**OU-LE-SESIM-02-L3-V1**
Module Title	Interpreting design, drawing and specifications for large scale (on-grid) system and energy storage system
Module Descriptor	This unit covers the knowledge, skills and attitudes required to interpret design, drawing and specifications for large scale (on-grid) system and energy storage system It specifically includes – Identify signs, symbols and specifications in the layout drawings, interpret layout drawings and apply freehand sketching.
Nominal Hours	**40 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Identify signs, symbols and specifications in the layout drawing 2. Interpret layout drawings 3. Apply freehand layout sketching.

Learning Outcome -1: Identify signs, symbols and specifications in the layout drawing	
Assessment Criteria	1. Layout drawing of the selected work plan is collected. 2. Signs, symbols and specifications are identified. 3. Signs, symbols and specifications are checked against job requirement
Conditions and Resources	• Workplace or Simulated Workplace • Chart of signs, symbols and specifications • Occupation related drawing and specification • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1 Layout drawings 1.1 Electrical single line diagram (SLD) 1.2 Solar mounting structure drawing 1.3 Wiring diagram 1.4 Layout of walkway and cleaning system 2 Chart of signs and symbols 3 Checking procedure of signs, symbols and specifications against job requirements
Job/ Task/ Activity	1. Select layout drawing 2. Identify signs, symbols and specifications 3. Check signs, symbols and specifications against job requirements
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Interpret layout and SLD	
Assessment Criteria	1. Layout drawing is interpreted. 2. Placement of components is identified in layout drawings 3. Wiring diagrams and schematics are read and understood. 4. Electrical pathways and interconnections are verified from drawings. 5. Walkway and plumbing line for cleaning system is identified. 6. Tools and equipment are identified, 7. Specifications are matched with available resources and job requirements.
Conditions and Resources	• Workplace or Simulated Workplace • Layout drawing • Walkway and plumbing line for cleaning system • Tools and equipments • Components, assemblies and materials • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. Layout drawing 2. Tools and equipments 3. Components 3.1 Solar Module 3.2 Module Mounting Structure (MMS) 3.3 Inverter (On-Grid) 3.4 Cable and connectors (DC and AC) 3.5 Remote Monitoring System 3.6 Data Logger 3.7 Hybrid Controller/ Fuel save controller 3.8 Combiner Box (AC and DC) 3.9 System protection devices 3.9.1 Surge Protector 3.9.2 Lighting Protection system 3.9.3 Earthling 3.9.4 DC switch 3.9.5 DC breaker /Fuse 3.10 Walkway 3.11 Cable Tray 3.12 Energy meter 3.13 Weather station 3.13.1 Irradiance Sensor/Pyranometer 3.13.2 Temperature sensor 3.13.3 Wind direction and speed sensor 3.14 Cleaning Tools 3.15 Battery

	3.16 Energy Storage System (ESS) /Battery Storage System (BSS) 3.16.1 Energy management system (EMS) 3.16.2 Power conditioning system (PCS) 3.16.3 Battery management system (BMS) 3.16.4 Battery
Job/ Task/ Activity	1. Interpret layout drawing 2. Identify tools and equipments 3. Prepare list of components 4. Identify wiring diagram and schematics 5. Identify electrical pathways and interconnections 6. Identify walkway and plumbing line for cleaning system 7. Match specifications with job requirements
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Apply freehand layout sketching.	
Assessment Criteria	1. Freehand sketching is applied where applicable in accordance with the job requirements. 2. The drawing is adjusted to the specifications.
Conditions and Resources	• Workplace or Simulated Workplace • Drawing and specifications • Freehand sketch • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. Layout drawing 2. Freehand sketch
Job/ Task/ Activity	1. Draw a freehand sketch wiring diagram
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Use Hand and Power Tools in Large Scale (On-Grid) System and Energy Storage System**
Unit Code	**OU-LE-SESIM-03-L3-V1**
Module Title	Using hand and power tools in large scale (on-grid) system and energy storage system
Module Descriptor	This unit covers the knowledge, skills and attitudes required to use hand and power tools in large scale (on-grid) system and energy storage system It specifically includes - select hand and power tools, practice to use hand and power tools and maintain hand and power tools
Nominal Hours	**30 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Select hand tools and power tools 2. Practice to use hand tools and power tools 3. Maintain hand tools and power tools

Learning Outcome -1: Select hand and power tools	
Assessment Criteria	1. Hand and power tools for specific tasks are identified. 2. Tools are inspected for safety and functionality before use.
Conditions and Resources	• Workplace or Simulated Workplace • Hand tools • Power tools • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1 Hand tools 1.1 Screw drivers 1.2 Diagonal cutting pliers 1.3 Cable cutter 1.4 Long nose pliers 1.5 Combination pliers 1.6 Adjustable wrenches 1.7 Socket wrench set 1.8 Torque wrench 1.9 Hand punch 1.10 Neon tester 1.11 Battery tester 1.12 Allen key 1.13 Ferrule printer/ punch 1.14 Crimping tool 1.15 Spanner set 1.16 Touch light 1.17 Electrician knife 2 Power tools 2.1 Hydraulic punch 2.2 Cordless drill machine 2.3 Electric hammer drill 2.4 Heat gun 2.5 Impact wrench 3 Tasks 3.1 Adjusting 3.2 Assembling 3.3 Straitening / flattening 3.4 Finishing items or components 3.5 Clamping 3.6 Marking and tagging

Job/ Task/ Activity	1. Identify hand tools as per task 2. Identify power tools as per task
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Practice to use hand tools and power tools	
Assessment Criteria	1. Proper techniques for using tools are demonstrated. 2. Tools are used following safety guidelines and manufacturer instructions.
Conditions and Resources	• Workplace or Simulated Workplace • Hand tools • Power tools • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker
Contents	1. Selection criteria of hand tools as per job requirements 2. Selection criteria of power tools as per job requirements 3. Safe practices rules for use hand tools and power tools
Job/ Task/ Activity	1. Use hand tools as per SOP 2. Use power tools as per SOP
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming

Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Maintain hand tools and power tools	
Assessment Criteria	1. Tools are cleaned and stored after use. 2. Damaged tools are identified and repaired or replaced. 3. Preventive maintenance of tools is performed periodically.
Conditions and Resources	• Workplace or Simulated Workplace • Hand tools • Power tools • Service manual • CBLM • Handout • Paper, Pen, Pencil and Eraser • Internet Facilities • White Board and marker • Audio video device
Contents	1. Routine maintenance 1.1. Cleaning 1.2. Lubricating 1.3. Tightening 1.4. Calibration and tunning 2. Hand tools and power tools maintaining procedure
Job/ Task/ Activity	1. Perform routine maintenance of hand and power tools 2. Store hand tools and power tools as per workplace standard
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Install Large Scale (On-Grid) System and Energy Storage System**
Unit Code	**OU-LE-SESIM-04-L3-V1**
Module Title	Installing Large Scale (On-Grid) System and Energy Storage System
Module Descriptor	This unit of competency requires the knowledge, skills and attitude required to install large scale (on-grid) system and energy storage system It specifically includes the tasks of identifying SES components, locating and prepare place, setting the solar panel and installing components
Nominal Hours	**90 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Prepare site and system components 2. Assemble and connect components 3. Conduct pre-commissioning testing

Learning Outcome -1: Prepare site and system components	
Assessment Criteria	1. Necessary safety use is implemented at the site. 2. Components are inspected and organized for assembling. 3. Temporary Power Source is ensured with safety
Conditions and Resources	• Workplace or Simulated Workplace • Safety measures • Large Solar system components • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. Safety measures 1.1 Safety railing 1.2 Lifeline 1.3 PPE
Job/ Task/ Activity	1. Demonstrate implementation of safety use at site 2. Organise components for assembling
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Assemble and connect components	
Assessment Criteria	1. Components are assembled as per design and manufacturer specifications. 2. Electrical connections are made following wiring diagrams. 3. Labeling of components and connections is ensured.
Conditions and Resources	• Workplace or Simulated Workplace • Large scale solar compmnents • Tools and equipment • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker
Contents	1. Components 1.1 PV Module 1.2 Module Mounting Structure (MMS) 1.3 Inverter (On-Grid) 1.4 Cable and connectors (DC and AC) 1.5 Remote Monitoring System 1.6 Data Logger 1.7 Hybrid Controller/ Fuel save controller 1.8 Combiner Box (AC and DC) 1.9 System protection devices (SPD, Fuse, CB, MCCB) 1.10 Walkway 1.11 Cable Tray 1.12 Energy meter 1.13 LPS and Surge Protection devices 1.14 Weather station 1.15 Cleaning Tools 1.16 Generator (Disel/ Gas) 1.17 Battery 1.18 Energy management system 1.19 Power conditioning system 1.20 Battery management system
Job/ Task/ Activity	1. Assemble components are as per design and manufacturer specifications. 2. Perform electrical connections following wiring diagrams; 3. Ensure labeling of components and connections

Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Conduct pre-commissioning testing	
Assessment Criteria	1. System is inspected for compliance with design and safety standards. 2. Pre-commissioning tests are conducted. 3. System is prepared for final commissioning.
Conditions and Resources	• Workplace or Simulated Workplace • Safety manual • Pre-commissioning tests instruments • Tools and equipment • CBLM • Handout • White Board and marker
Contents	1. Safety manual 2. Pre-commissioning tests 2.1 Continuity and polarity tests 2.2 Earth resistance test 2.3 Insulation test 2.4 Pre-commissioning tests procedure
Job/ Task/ Activity	1. Conduct pre-commissioning tests 2. Prepare system for final cimmissioning
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Unit of Competency	**Maintain and Troubleshoot Large Scale (On-Grid) System and Energy Storage System**
Unit Code	**OU-LE-SESIM-05-L3-V1**
Module Title	Maintaining and troubleshooting large scale (on-grid) system and energy storage system
Module Descriptor	This unit of competency covers the knowledge, skills and attitude required to maintain and troubleshoot large scale (on-grid) system and energy storage system. It specially includes the tasks of performing routine maintenance and identifying and troubleshoot faults.
Nominal Hours	**50 Hours**
Learning Outcome	After completing the practice of the module, the trainees will be able to perform the following jobs: 1. Perform routine maintenance 2. Identify and troubleshoot faults 3. Replace faulty components and ensure system restoration

Learning Outcome -1: Perform routine maintenance	
Assessment Criteria	1. PPE is used and OSH is observed 2. Routine maintenance schedule is followed. 3. Cleaning of system components, such as panels, is performed. 4. Quality of water for cleaning system is checked. 5. Periodic inspections of wiring and connections are carried out.
Conditions and Resources	• Workplace or Simulated Workplace • Large scale Solar electrical system material and accessories • Tools and equipment • CBLM • Handout • Paper, Pen, Pencil and Eraser • White Board and marker • Audio video device
Contents	1. Routine maintenance schedule: 2. Wiring and connection 2.1 Terminal connection of switches, sockets, light fixtures 2.2 Terminal connection of PV Module 2.3 Terminal connection of Battery Management System 2.4 Terminal connection of Power conditioning system 2.5 Terminal connection of inverter 2.6 Terminal connection of battery 2.7 Switchgear and protection equipment incoming and outgoing points 2.8 Connection of solar operated motor 3. Periodic inspections of wiring and connections
Job/ Task/ Activity	1. Check the quality of water for panel cleaning 2. Perform cleaning of components, such as panel 3. Perform periodic inspections of wiring and connections
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -2: Identify and troubleshoot faults	
Assessment Criteria	1. Faulty components or connections are identified through inspection and testing. 2. Appropriate troubleshooting techniques are applied. 3. Root cause of faults is documented.
Conditions and Resources	• Workplace or Simulated Workplace • Faults testing equipment • Tools and equipment • Major component and accessories • CBLM • Handout • White Board and marker
Contents	1. Faults testing procedure 2. Appropriate troubleshooting techniques 3. Procedure of identifying root cause of faults
Job/ Task/ Activity	1. Identify faulty components or connections 2. Apply appropriate troubleshooting techniques 3. Identify root cause of faults
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Learning Outcome -3: Replace faulty components and ensure system restoration	
Assessment Criteria	1. Faulty components are replaced with compatible and functional ones under supervision 2. System is tested after repair to ensure functionality. 3. Maintenance and repair records are updated as per standard
Conditions and Resources	• Workplace or Simulated Workplace • Testing equipments • Tools and equipment • Major component and accessories • CBLM • Handout • Internet Facilities • White Board and marker
Contents	1 Procedure of identifying faulty components and replacing it as per standard; 2 Testing procedure of the system for functionality; 3 Maintenance and repair records
Job/ Task/ Activity	1. Identify faulty components and replace it; 2. Test the system for functionality; 3. Update repair records as per SOP;
Training Method	• Discussion • Presentation • Demonstration • Guided Practice • Individual Practice • Project Work • Problem Solving • Brainstorming
Assessment Method	• Written Test • Demonstration • Oral questioning • Portfolio

Competency based curriculum (CBC)

The CBC is also termed as Competency Based Curriculum and is developed based on NCS and labour market needs.

CBT curricula are designed considering the following principles.

- Identification of competencies in consultation with experts from industries and training institutes
- Adopting 21st century pedagogy and methodology
- Training must be in line with labour market need and industrial standard
- Creating training modality to experience real working situation through platform such as OJT and Industrial visit

What is Competency-Based Curriculum (CBC)

- A competency-based curriculum is a framework or guide for the subsequent detailed development of competencies, associated methodologies, training and assessment resources.

- The CBC specifies the outcomes which are consistent with the requirements of the workplace as agreed through the industry or community consultations.

- CBC can be developed immediately when competency standards exist.

- When competency standards do not exist, curriculum developers need to clearly define the learning outcomes to be attained. The standard of performance required must be appropriate to industry and occupational needs through the industry/enterprise or specified client group consultations.

Validation of Competency Based Curriculum

The Competency Based Curriculum for National Skills Certificate in Solar Electrical System Installation and Maintenance; Level-03 is validated by NSDA on 30 December 2024.

List of Members

Sl No	Name, and Address	Position in the committee
1.	Md Abdur Razzaque, Chairman, LEISC	Chairperson
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